

**WE CLAIM:**

1                   1.       A system for implementing surgical procedures comprising:  
2                   an ultrasonic surgical handpiece having an end-effector;  
3                   a generator console for controlling the handpiece;  
4                   an electrical connection connecting the handpiece and the console, wherein  
5                   the console sends a drive current to drive the handpiece which imparts ultrasonic longitudinal  
6                   movement to the end-effector; and  
7                   a finger-operated switch provided on a housing of the handpiece, the switch  
8                   activating the handpiece at a first power level if a monitored pressure on the switch reaches  
9                   a high threshold, and deactivating the handpiece if the monitored pressure reaches a low  
10                  threshold.

1                   2.       The system of claim 1 wherein the switch is distally located on the  
2                   handpiece.

1                   3.       The system of claim 1 wherein the handpiece is operated at a power  
2                   level selected from a plurality of power levels if the monitored pressure reaches a specific  
3                   threshold of a respective plurality of thresholds corresponding to the plurality of power  
4                   levels.

1                    4.     The system of claim 1 wherein the pressure is monitored by a sensor  
2     located inside the housing of the handpiece selected from a group consisting of an electro-  
3     mechanical switch, a force-sensitive resistor, force sensitive capacitor, strain gauge, magnet,  
4     ferromagnet, piezo film and piezo ceramic.

1                    5.     The system of claim 1 wherein the switch comprises a pair of switch  
2     button members:

1                    6.     The system of claim 1 wherein the switch further comprises an  
2     inactive center region for resting of a finger and serving as a tactile reference.

1                    7.     The system of claim 1 wherein the switch is generally user-alignable  
2     with the end-effector.

1                    8.     The system of claim 1 wherein the switch is symmetrically aligned and  
2     indexed to the end-effector.

1                    9.     The system of claim 5 wherein each of the switch button members  
2     comprises:

3                    an upper surface and a lower surface;  
4                    a first post and a second post extending outwardly away from the lower  
5     surface; and

6 a first raised section and a second raised section on the upper surface, said  
7 raised section being supported by a center recessed section formed therebetween.

1 10. The system of claim 9 wherein the first post is disposed generally  
2 opposite the first raised section and the second post is disposed generally opposite the second  
3 raised section so that the first post is directed toward the interior of the handpiece when the  
4 first raised section is depressed and the second post is directed toward the interior of the  
5 handpiece when the second raised section is depressed.

1 11. The system of claim 1 wherein the switch is a ring switch with a ring-  
2 like circumferential appendage on the handpiece that is located near a distal end of the  
3 handpiece.

1 12. The system of claim 11 wherein the ring switch comprises a capacitive  
2 transducer having a center ring, an outer layer of elastomer on the exterior of the center ring,  
3 and a ring electrode on top of the ring switch.

1 13. The system of claim 11 further including multicolor illumination and  
2 a control such that the ring switch becomes illuminated in difference colors corresponding  
3 to a plurality of pressure thresholds.

1                   14.     The system of claim 11 wherein the ring switch is a sensor comprising  
2     a piezo portion and a substrate adjacently disposed with the piezo portion, the ring switch  
3     outputting a first polarity signal when pressure is applied to the piezo portion and outputting  
4     a second opposing polarity signal when pressure is applied to the substrate.

1                   15.     The system of claim 11 wherein the ring switch is a sensor comprising  
2     a first piezo ring, a second piezo ring, and a center ring disposed between the first piezo ring  
3     and the second piezo ring, the ring switch outputting a first polarity signal when pressure is  
4     applied to the first piezo ring and outputting a second opposing polarity signal when pressure  
5     is applied to the second piezo ring.

1                   16.     The system of claim 11 wherein the ring switch comprises a first seal  
2     and a second seal, and a piezo ring disposed between the first seal and the second seal, the  
3     ring switch outputting a first polarity signal when pressure is applied in one direction to the  
4     piezo ring and outputting a second opposing polarity signal when pressure is applied in  
5     another direction to the piezo ring.

1                   17.     The system of claim 11 wherein the ring switch comprises a pair of  
2     outer rings, a center ring disposed between the outer rings, and a pair of flexible rings  
3     respectfully located on the exterior of the outer rings to support the center ring with the outer  
4     rings, and a pair of piezo rings fixed to two sides of bottom of the center ring.

1                   18.    The system of claim 11 wherein the ring switch comprises a support  
2                   ring and a pair of adjacently located activation zones which are circumferential bands serially  
3                   connected with the support ring.

1                   19.    The system of claim 18 wherein the activation zones consist of one  
2                   of an electro-mechanical switch, force sensitive resistors, force sensitive capacitors, strain  
3                   gauges, magnets, and piezo material.

1                   20.    The system of claim 18 wherein the ring switch further comprises a  
2                   middle rib disposed between the activation zones, the middle rib serving as a divider for the  
3                   activation zones.

1                   21.    The system of claim 20 further including multicolor illumination and  
2                   a control so that the middle rib becomes illuminated in difference colors corresponding to  
3                   a plurality of pressure thresholds.

1                   22.    The system of claim 18 wherein the ring switch further comprises a  
2                   distal rib located on a distal end of the activation zones.

1                   23.    The system of claim 22 further including multicolor illumination and  
2                   a control so that the distal rib becomes illuminated in difference colors corresponding to a  
3                   plurality of thresholds.

1                    24.    The system of claim 18 wherein the ring switch further comprises a  
2 proximal rib on a proximal end of the activation zones.

1                    25.    The system of claim 24 further including multicolor illumination and  
2 a control so that the proximal rib becomes illuminated in difference colors corresponding to  
3 a plurality of thresholds.

1                    26.    The system of claim 18 wherein each of the activation zones is further  
2 divided into subzones corresponding to variable power levels of the plurality of pressure  
3 thresholds.

1                    27.    The system of claim 1 further comprising switches on opposing sides  
2 of the handpiece that generally avoid inadvertent activation.

1                    28.    The system of claim 1 wherein the switch is a hysteresis switch.

1                    29.    The system of claim 11 wherein the ring switch further comprises a  
2 sliding barrier covering a portion of the circumferential appendage.

1                    30.    The system of claim 1 wherein the switch provides its switching  
2 functionality according to a lagging effect as the monitored pressured on the switch is

3 changed.

1 31. A system for implementing surgical procedures comprising:  
2 an ultrasonic surgical handpiece having an end-effector;  
3 a generator console for controlling the handpiece;  
4 an electrical connection connecting the handpiece and the console, wherein  
5 the console sends a drive current to drive the handpiece which imparts ultrasonic longitudinal  
6 movement to the end-effector; and  
7 a finger-operated switch provided on a housing of the handpiece, the switch  
8 activating the handpiece at a first power level and deactivating the handpiece if a low  
9 threshold is reached.

1 32. The system of claim 31 wherein the switch is distally located on the  
2 handpiece.

1 33. The system of claim 31 wherein the switch further comprises a sensor  
2 located inside the housing of the handpiece selected from a group consisting of an electro-  
3 mechanical switch, a force-sensitive resistor, force sensitive capacitor, strain gauge, magnet,  
4 ferromagnet, piezo film and piezo ceramic.

1 34. The system of claim 31 wherein the switch comprises a pair of switch  
2 button members.

1                   35.    The system of claim 31 wherein the switch further comprises an  
2   inactive center region for resting of a finger and serving as a tactile reference.

1                   36.    The system of claim 31 wherein the switch is generally user-alignable  
2   with the end-effector.

1                   37.    The system of claim 31 wherein the switch is symmetrically aligned  
2   and indexed to the end-effector.

1                   38.    The system of claim 34 wherein each of the switch button members  
2   comprises:  
3                    an upper surface and a lower surface;  
4                    a first post and a second post extending outwardly away from the lower  
5   surface; and  
6                    a first raised section and a second raised section on the upper surface, said  
7   raised section being supported by a center recessed section formed therebetween.

1                   39.    The system of claim 38 wherein the first post is disposed generally  
2   opposite the first raised section and the second post is disposed generally opposite the second  
3   raised section so that the first post is directed toward the interior of the handpiece when the  
4   first raised section is depressed and the second post is directed toward the interior of the



5 handpiece when the second raised section is depressed.

1 40. The system of claim 31 wherein the switch activates the handpiece at  
2 the first power level if a monitored pressure on the switch reaches a high threshold, and  
3 deactivating the handpiece if the monitored pressure reaches the low threshold.

1 41. The system of claim 40 wherein the switch is a ring switch with a ring-  
2 like circumferential appendage on the handpiece that is located near a distal end of the  
3 handpiece.

1 42. The system of claim 41 wherein the ring switch comprises a capacitive  
2 transducer having a center ring, an outer layer of elastomer on the exterior of the center ring,  
3 and a ring electrode on top of the ring switch.

1 43. The system of claim 41 further including multicolor illumination and  
2 a control such that the ring switch becomes illuminated in difference colors corresponding  
3 to a plurality of pressure thresholds.

1                   44.     The system of claim 41 wherein the ring switch is a sensor comprising  
2     a piezo portion and a substrate adjacently disposed with the piezo portion, the ring switch  
3     outputting a first polarity signal when pressure is applied to the piezo portion and outputting  
4     a second opposing polarity signal when pressure is applied to the substrate.

1                   45.     The system of claim 41 wherein the ring switch is a sensor comprising  
2     a first piezo ring, a second piezo ring, and a center ring disposed between the first piezo ring  
3     and the second piezo ring, the ring switch outputting a first polarity signal when pressure is  
4     applied to the first piezo ring and outputting a second opposing polarity signal when pressure  
5     is applied to the second piezo ring.

1                   46.     The system of claim 41 wherein the ring switch comprises a first seal  
2     and a second seal, and a piezo ring disposed between the first seal and the second seal, the  
3     ring switch outputting a first polarity signal when pressure is applied in one direction to the  
4     piezo ring and outputting a second opposing polarity signal when pressure is applied in  
5     another direction to the piezo ring.

1                   47.     The system of claim 41 wherein the ring switch comprises a pair of  
2     outer rings, a center ring disposed between the outer rings, and a pair of flexible rings  
3     respectfully located on the exterior of the outer rings to support the center ring with the outer  
4     rings, and a pair of piezo rings fixed to two sides of bottom of the center ring.

1                   48.    The system of claim 41 wherein the ring switch comprises a support  
2   ring and a pair of adjacently located activation zones which are circumferential bands serially  
3   connected with the support ring.

1                   49.    The system of claim 48 wherein the activation zones consist of one  
2   of an electro-mechanical switch, force sensitive resistors, force sensitive capacitors, strain  
3   gauges, magnets, and piezo material.

1                   50.    The system of claim 48 wherein the ring switch further comprises a  
2   middle rib disposed between the activation zones, the middle rib serving as a divider for the  
3   activation zones.

1                   51.    The system of claim 50 further including multicolor illumination and  
2   a control so that the middle rib becomes illuminated in difference colors corresponding to  
3   a plurality of pressure thresholds.

1                   52.    The system of claim 48 wherein the ring switch further comprises a  
2   distal rib located on a distal end of the activation zones.

1                   53.    The system of claim 52 further including multicolor illumination and  
2   a control so that the distal rib becomes illuminated in difference colors corresponding to a  
3   plurality of thresholds.

1                   54.    The system of claim 48 wherein the ring switch further comprises a  
2                   proximal rib on a proximal end of the activation zones.

1                   55.    The system of claim 54 further including multicolor illumination and  
2                   a control so that the proximal rib becomes illuminated in difference colors corresponding to  
3                   a plurality of thresholds.

1                   56.    The system of claim 48 wherein each of the activation zones is further  
2                   divided into subzones corresponding to variable power levels of the plurality of pressure  
3                   thresholds.

1                   57.    The system of claim 31 further comprising switches on opposing sides  
2                   of the handpiece that generally avoid inadvertent activation.

1                   58.    The system of claim 31 wherein the switch is a hysteresis switch.

1                   59.    The system of claim 41 wherein the ring switch further comprises a  
2                   sliding barrier covering a portion of the circumferential appendage.

1                   60.    The system of claim 48 wherein the ring switch further comprises a  
2                   sliding barrier covering at least one of the activation zones.

1                   61.    A method for controlling an ultrasonic surgical handpiece using a  
2                   switch located on a housing of the handpiece, comprising the steps of:

3                               monitoring pressure applied to the housing using the switch;  
4                               activating the handpiece at a first power level if the monitored pressure  
5                   reaches a high threshold; and  
6                               deactivating the handpiece if the monitored pressure reaches a low threshold.

1                   62.    The method of claim 61 further comprising the step of operating the  
2                   handpiece at a power level selected from a plurality of power levels if the monitored pressure  
3                   reaches a specific threshold of a respective plurality of thresholds corresponding to the  
4                   plurality of power levels.

1                   63.    The method of claim 61 wherein the pressure is monitored by a sensor  
2                   located inside the housing of the handpiece selected from a group consisting of an electro-  
3                   mechanical switch, a force-sensitive resistor, force sensitive capacitor, strain gauge, magnet,  
4                   ferromagnet, piezo film and piezo ceramic.

1                   64.    The method of claim 61 wherein the switch is generally aligned with  
2                   the blade as the blade is rotated.

1                   65.    The method of claim 61 wherein the switch provides its switching

2 functionality according to a lagging effect as the monitored pressured is changed.

1 66. An ultrasonic surgical handpiece having a housing with a finger-  
2 operated switch located thereon, the switch having a sensor for monitoring pressure thereon  
3 so that the handpiece is placed in an operative mode when the sensor monitors a pressure  
4 above a first threshold and is placed in an inoperative mode when the pressure is below a  
5 second threshold.

1 67. The handpiece of claim 66 wherein the first and second thresholds are  
2 the same.

1 68. The handpiece of claim 66 wherein the first threshold is at a higher  
2 pressure than the second threshold.